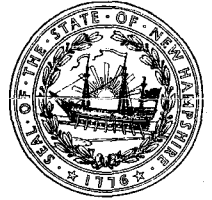




The State of New Hampshire  
*Department of Environmental Services*



Michael P. Nolin  
Commissioner

August 31, 2005  
**Letter of Deficiency**  
DSP#05-026

Mr. Donald Ware  
Hanover Water Works  
Box 1006  
Hanover, NH 03755

RE: Hanover Center Reservoir Dam #108.14, Hanover

Dear Mr. Ware:

The Department of Environmental Services, Dam Bureau (DES) consistently strives to enhance the safety of dams in New Hampshire through its dam safety program. One of the many instruments that play a part in reaching this goal is our inspection program. DES is forwarding this correspondence to you to advise you that in accordance with RSA 482:12 and Env-Wr 502.02, an inspection of the subject dam was conducted on June 23, 2005. During this visual inspection and/or file review, the following deficiencies were observed:

1. There appears to be some benching of the upstream slope located at the normal pool level;
2. There appears to be soil erosion adjacent to both the left and right upstream spillway wing walls;
3. There was water located along the entire downstream toe of the left embankment. According to the file this is a historical condition that is likely due to adjacent hillside runoff. This flow travels along the toe of the dam and enters a small concrete structure which transitions to a 15 inch RCP culvert which discharges near the main spillway outlet. The downstream end of the culvert has failed as a result of undermining of the culvert to such an extent that the most downstream end of the culvert has fallen off;
4. There is a 1/8 inch crack in the concrete wall located at the left downstream end of the spillway outlet culvert;
5. The construction joint located in the floor of the spillway outlet channel has deteriorated causing a hydraulic jump in the channel. The joint is located at the transition from the box culvert to the open channel portion of the outlet structure;
6. At the same location of the construction joint mentioned above, there is a void under the left wall at the contact with the floor that extends at least 12 inches under the wall;
7. At the same transition from the box culvert to the open channel, the left and right retaining walls of the open channel have moved approximately 1/2 inch and 1/4 inch (respectively) from their original location. A steel pipe brace was placed at this location. Historical photos indicate that this brace has been in place for a long time, however, there are no good comparative photos or mention of wall movement to determine if the condition has remained the same or changed. The pipe brace currently has a slight bend in the pipe in a downward direction that could be indicative of movement, however, it could also be an as-built condition;

8. There is a leak through the concrete all located at the left end of the stoplog bays. The leak exits the concrete wall approximately 2 inches downstream from the steel stoplog channel embedded in the wall and 3 feet below normal pool;
9. There was a tail water present at the downstream toe of the right embankment as there has been historically preventing inspection for seepage. There was no evidence of any embankment soil transport within the rip rap at the embankment toe;
10. There is a 10-12 inch tree located above the spillway outlet culvert;
11. There are trees located above the discharge pipes located at the toe of the right embankment (downstream from the gatehouse);
12. There are trees and brush located within 10 feet of the spillway outlet channel alignment;
13. There are trees encroaching on the downstream slope of the dam located to the right of the spillway discharge channel;
14. There are at least two trees located at the right end of the dam on the dam crest;
15. According to the design plans there is a 6 inch perforated toe drain with 3 separate outfalls that 'daylight' at the toe of the dam. The left most toe drain is connected to the concrete drainage structure located at the toe of the left embankment. The other two toe drains are located between the gatehouse and spillway and daylight near the tailwater at the toe of the dam (see attached plan); and
16. The Emergency Action Plan (EAP) was completed in 1993 and last updated in 2003.

DES believes that the above deficiencies be addressed prior to the next scheduled inspection in 2007:

1. Survey the upstream slope of embankment paying particular attention to the embankment along the waterline to determine if benching had occurred. The design plans indicate the upstream slope should be 2 horizontal: 1 vertical. If the slope varies from the design it should be repaired as necessary;
2. Repair, as necessary, any soil erosion adjacent to the left and right upstream spillway wing walls;
3. Repair the downstream end of the 15 inch RCP culvert that is connected to the concrete structure located at the toe of the left embankment;
4. Repair the construction joint located on the floor of the spillway chute. The joint is located at the transition from the box culvert to the open channel portion of the outlet structure;
5. Repair the void under the left wall at the same location as the construction joint mentioned above;
6. Repair the leak adjacent to the left end of the stoplog bays. The leak is exiting the concrete wall approximately 2 inches downstream from the steel stoplog channel and 3 feet below normal pool;

7. Remove trees and brush from the following locations:
  - a. Directly above the spillway outlet culvert there is a 10-12 inch diameter tree;
  - b. The trees located around the discharge pipes at the toe of the right embankment;
  - c. All trees from within 10 feet on either side of the spillway outlet channel;
  - d. The trees located at the right end of the embankment near the road;
  - e. The trees that are encroaching on the downstream slope of the dam located to the right of the spillway discharge channel;
8. Locate, inspect and report the condition of the three 6 inch perforated toe drains as depicted on the attached plan; and
9. Update and test the EAP as necessary. If you have questions relative to the current standing of your EAP please contact Bethann McCarthy, P.E., EAP Coordinator at 271-3406.

DES is requesting that you complete and submit the attached "Intent to Complete Repairs" form, within 30 days of receipt of this letter, that will provide for correction of the identified deficiencies by the date(s) indicated above. Please call or write to our office if the repairs are completed ahead of the aforementioned schedule so that DES may schedule a follow-up inspection. Unless notified otherwise, DES will conduct the follow-up inspection on or after the date(s) indicated above. If you believe changes to the items of work or dates are necessary, please make the changes directly on the form and provide a brief explanation. We have enclosed a self addressed stamped envelope for you to return this form.

Our intent in sending you this correspondence is to make you aware of items that DES believes warrant your attention to insure the continued safe operation of your dam. It is our hope that, through the submittal of the attached form and a commitment to keeping a well-maintained dam, you will voluntarily comply with the requested items of work. If we do not receive the intent form or a similarly adequate written reply, we will assume that you are in agreement with our findings and recommendations and DES will carry out follow-up inspections accordingly.

If you have any questions or comments regarding this Letter of Deficiency or would like to be present at future inspections, please contact me at 271-3406, or write to the Water Division at the address listed on the bottom of the cover page.

Sincerely,

**COPY**

Jeffrey M. Blaney, P.E.  
Dam Safety Engineer

Attachments DB8, DB13, Plan  
cc: Gretchen R. Hamel, Legal Unit Administrator ✓  
Bethann McCarthy, P.E., EAP Coordinator  
Town of Hanover

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